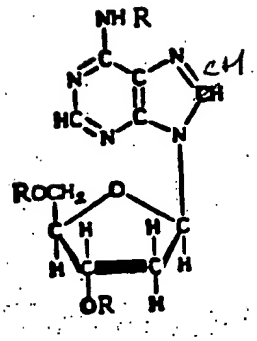
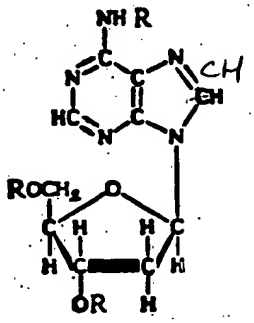


(I)

wherein R is hydrogen or an acyl radical of a metabolite other than acetyl, with the proviso that at least one R is not hydrogen, or a pharmaceutically acceptable salt thereof.

The preferred acyl derivatives of 2'-deoxyadenosine are those having the formula (I)

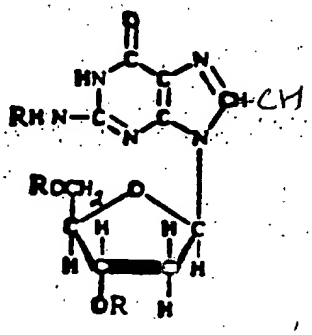


(I)

wherein R is H or an acyl group derived from a carboxylic acid selected from one or more of the group consisting of pyruvic acid, lactic acid, enolpyruvic acid, an amino acid, a fatty acid other than acetic acid, lipoic acid, nicotinic acid, pantothenic acid, succinic acid, fumaric acid, p-aminobenzoic acid, betahydroxybutyric acid, orotic acid,

and carnitine, with the proviso that at least one R is not hydrogen, or a pharmaceutically acceptable salt thereof.

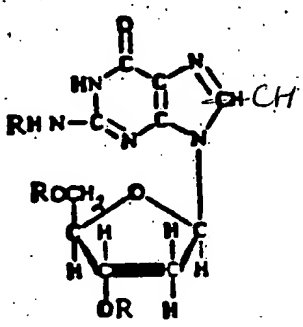
Broadly, the acyl derivatives of 2'-deoxyguanosine are those having the formula (II)



(II)

wherein R is hydrogen or an acyl radical of a metabolite other than acetyl, with the proviso that at least one R is not hydrogen, or a pharmaceutically acceptable salt thereof.

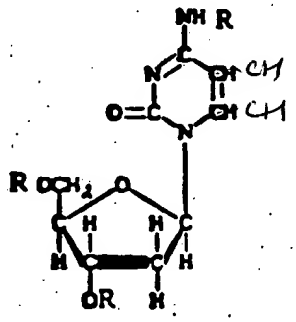
The preferred acyl derivatives of 2'-deoxyguanosine are those having the formula (II)



(II)

wherein R is H or an acyl group derived from a carboxylic acid selected from one or more of the group consisting of pyruvic acid, lactic acid, enolpyruvic acid, an amino acid, a fatty acid other than acetic acid, lipoic acid, nicotinic acid, pantothenic acid, succinic acid, fumaric acid, p-aminobenzoic acid, betahydroxybutyric acid, orotic acid, and carnitine, with the proviso that at least one R is not hydrogen, or a pharmaceutically acceptable salt thereof.

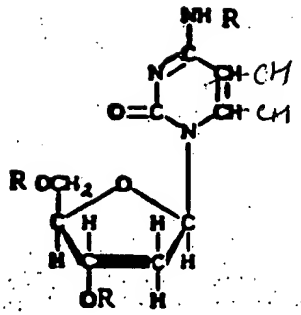
Broadly, the acyl derivatives of 2'-deoxycytidine are those having the formula (III)



(III)

wherein R is hydrogen or an acyl radical of a metabolite other than acetyl, with the proviso that at least one R is not hydrogen, or a pharmaceutically acceptable salt thereof.

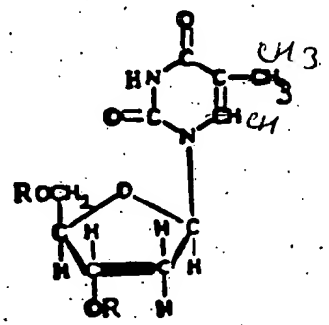
The preferred acyl derivatives of 2'-deoxycytidine are those having the formula (III)



(III)

wherein R is H or an acyl group derived from a carboxylic acid selected from one or more of the group consisting of pyruvic acid, lactic acid, enolpyruvic acid, an amino acid, a fatty acid other than acetic acid, lipoic acid, nicotinic acid, pantothenic acid, succinic acid, fumaric acid, p-aminobenzoic acid, betahydroxybutyric acid, orotic acid, and carnitine, with the proviso that at least one R is not hydrogen, or a pharmaceutically acceptable salt thereof.

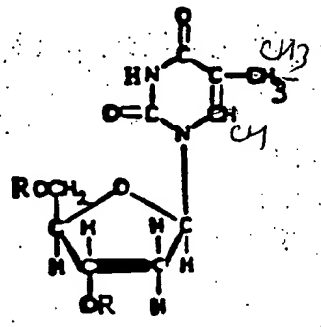
Broadly, the acyl derivatives of 2'-deoxythymidine are those having the formula (IV)



(IV)

wherein R is hydrogen or an acyl radical of a metabolite other than a fatty acid having less than five carbon atoms, with the proviso that at least one R is not hydrogen, or a pharmaceutically acceptable salt thereof.

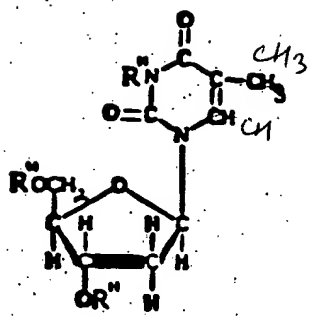
The preferred acyl derivatives of 2'-deoxythymidine are those having the formula (IV)



(IV)

wherein R is H or an acyl group derived from a carboxylic acid selected from one or more of the group consisting of pyruvic acid, lactic acid, enolpyruvic acid, an amino acid, a fatty acid containing 5 or more carbon atoms, lipoic acid, nicotinic acid, pantothenic acid, succinic acid, fumaric acid, p-aminobenzoic acid, betahydroxybutyric acid, orotic acid and carnitine, with the proviso that at least one R substituent is not hydrogen, or a pharmaceutically acceptable salt thereof.

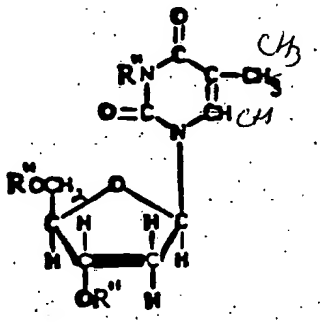
The acyl derivatives of 2'-deoxythymidine may also be those having the formula (V)



(V),

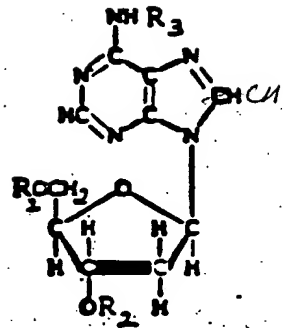
wherein R'' is hydrogen or an acyl radical of a metabolite, with the proviso that the R'' on nitrogen is not hydrogen, or a pharmaceutically acceptable salt thereof.

Preferred acyl derivatives of 2'-deoxythymidine are those having the formula (V)

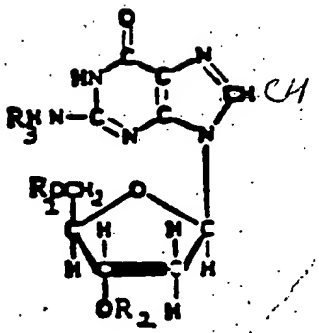


(V)

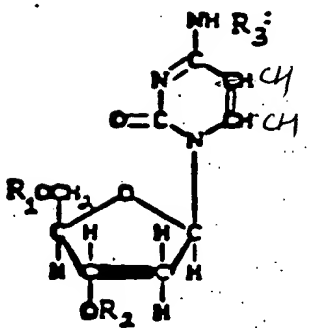
wherein R'' is H or an acyl group derived from a carboxylic acid selected from one or more of the group consisting of pyruvic acid, lactic acid, enolpyruvic acid, an amino acid, a fatty acid, lipoic acid, nicotinic acid, pantothenic acid, succinic acid, fumaric acid, p-aminobenzoic acid, betahydroxybutyric acid, orotic acid, and carnitine, with



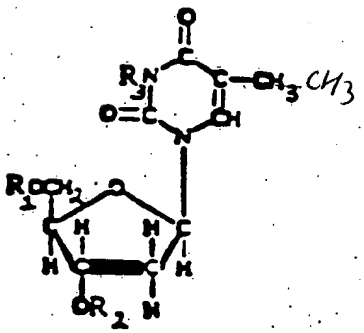
(I)



(II)



(III)



(IV)

wherein R_1, R_2, and R_3 are the same or different and each is H or an acyl group derived from a carboxylic acid, provided that at least one of said substituents R_1, R_2, and R_3 in each of said groups of compounds is not hydrogen, or pharmaceutically acceptable salts thereof. In a preferred embodiment, R_1, R_2, and R_3 are the same or different and each is H or an acyl group derived from a carboxylic acid selected from the group consisting of an amino acid, an unbranched fatty acid containing 2 to 22 carbon atoms, a dicarboxylic acid containing 3 to 22 carbon atoms, and an optionally substituted benzoyl or heterocyclic aromatic carboxylic acid that is substantially nontoxic. Preferred

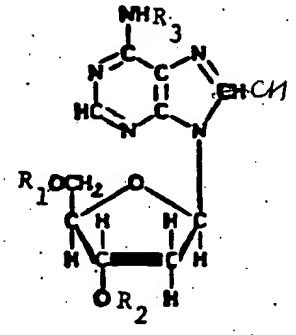
substituents. Preferred such substituents are basic amino acids (lysine or arginine), acidic amino acids (glutamate or aspartate), or dicarboxylic acids.

For parenteral injection, acyl derivatives with polar substituents, which are therefore water soluble yet resistant to premature degradation or elimination, may also be used with advantage.

Preferred Compounds of The Invention

The preferred compounds of the invention are

(1) acyl derivatives of 2'-deoxyadenosine, having the formula



wherein R_1, R_2, and R_3 may be the same or different and each is hydrogen or an acyl group derived from

(a) an unbranched fatty acid with 3 to 22 carbon atoms,

(b) an amino acid selected from the group consisting of glycine, the L forms of alanine, valine, leucine, isoleucine, tyrosine, proline, hydroxyproline, serine, threonine, cysteine, aspartic acid, glutamic acid, arginine, lysine, histidine, carnitine, and ornithine,

(c) nicotinic acid, or

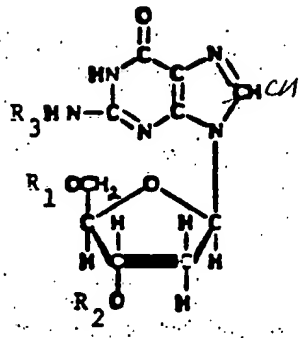
(d) a dicarboxylic acid having 3 to 22 carbon atoms, provided that

(i) not all of R_1, R_2, and R_3 are H, and

(ii) where R_3 is not H, then R_1 and/or R_2 may also be acetyl,

or a pharmaceutically acceptable salt thereof;

(2) acyl derivatives of 2'-deoxyguanosine having the formula



wherein R_1, R_2, and R_3 may be the same or different and each is hydrogen or an acyl group derived from

(a) an unbranched fatty acid with 3 to 22 carbon atoms,

(b) an amino acid selected from the group consisting of glycine, the L forms of alanine, valine, leucine, isoleucine, tyrosine, proline, hydroxyproline, serine, threonine, cysteine, aspartic acid, glutamic acid, arginine, lysine, histidine, carnitine, and ornithine,

(c) nicotinic acid, or

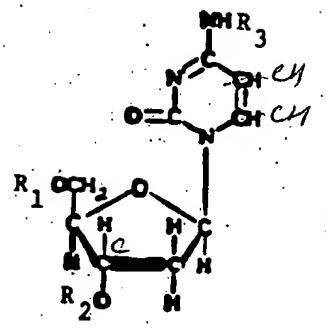
(d) a dicarboxylic acid having 3 to 22 carbon atoms, provided that

(i) not all of R_1, R_2, and R_3 are H, and

(ii) where R_3 is not H, then R_1 and/or R_2 may also be acetyl,

or a pharmaceutically acceptable salt thereof;

(3) acyl derivatives of 2'-deoxycytidine, having the formula



wherein R_1, R_2, and R_3 may be the same or different and each is hydrogen or an acyl group derived from

(a) an unbranched fatty acid with 3 to 22 carbon atoms,

(b) an amino acid selected from the group consisting of glycine, the L forms of alanine, valine, leucine, isoleucine, tyrosine, proline, hydroxyproline, serine, threonine, cysteine, aspartic acid, glutamic acid, arginine, lysine, histidine, carnitine, and ornithine,

(c) nicotinic acid, or

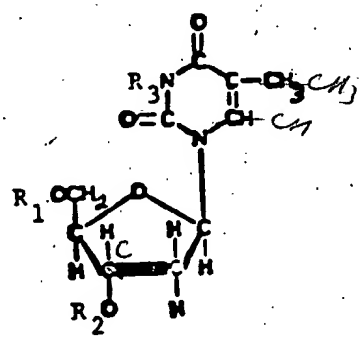
(d) a dicarboxylic acid having 3 to 22 carbon atoms, provided that

(i) not all of R_1, R_2, and R_3 are H, and

(ii) where R_3 is not H, then R_1 and/or R_2 may also be acetyl,

or a pharmaceutically acceptable salt thereof;

(4) acyl derivatives of 2'-deoxythymidine, having the formula



wherein R_1 is an acyl group derived from

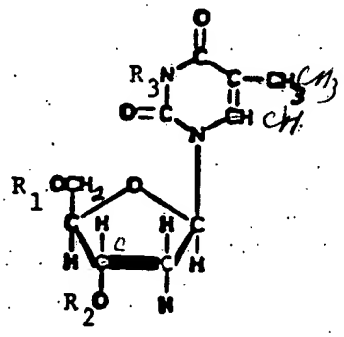
(a) an unbranched fatty acid with 3 to 15 or 17 to 22 carbon atoms,

(b) an amino acid selected from the group consisting of glycine, the L forms of alanine, valine, leucine, isoleucine, tyrosine, proline, hydroxyproline, serine, threonine, cysteine, aspartic acid, glutamic acid, arginine, lysine, histidine, carnitine, and ornithine,

(c) nicotinic acid, or

(d) a dicarboxylic acid having 3 to 22 carbon atoms, and R_2 and R_3 are H, or a pharmaceutically acceptable salt thereof;

(5) acyl derivatives of 2'-deoxythymidine, having the formula



wherein R_1 is H, R_2 is an acyl group derived from

(a) an unbranched fatty acid with 3 to 13 or 15 to 22 carbon atoms,

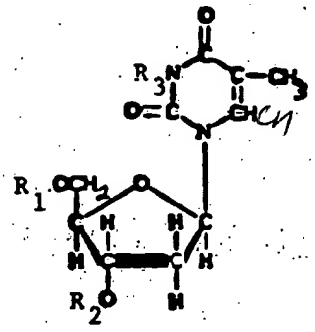
(b) an amino acid selected from the group consisting of glycine, the L forms of alanine, valine, leucine, isoleucine, tyrosine, proline, hydroxyproline, serine, threonine, cysteine, aspartic acid, glutamic acid, arginine, lysine, histidine, and ornithine,

(c) nicotinic acid, or

(d) a dicarboxylic acid with 3 to 22 carbon atoms,

and R_3 is H or a pharmaceutically acceptable salt thereof;

(6) acyl derivatives of 2'-deoxythymidine, having the formula



wherein R_1 and R_2 may be the same or different and each is an acyl group derived from

(a) an unbranched fatty acid with 5 to 22 carbon atoms,

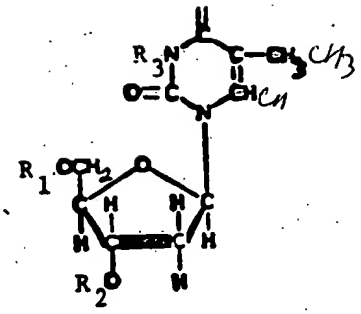
(b) an amino acid selected from the group consisting of glycine, the L forms of alanine, valine, leucine, isoleucine, tyrosine, proline, hydroxyproline, serine, threonine, cysteine, aspartic acid, glutamic acid, arginine, lysine, histidine, carnitine, and ornithine,

(c) nicotinic acid, or

(d) a dicarboxylic acid with 3 to 22 carbon atoms,

and R_3 is H, or a pharmaceutically acceptable salt thereof; and

(7) acyl derivatives of 2'-deoxythymidine, having the formula



wherein R_1 and R_2 are the same or different and each is an acyl group derived from

(a) an unbranched fatty acid with 2 to 22 carbon atoms,

(b) an amino acid selected from the group consisting of glycine, the L forms of alanine, valine, leucine, isoleucine, tyrosine, proline, hydroxyproline, serine, threonine, cysteine, aspartic acid, glutamic acid, arginine, lysine, histidine, carnitine, and ornithine,

(c) nicotinic acid, or

(d) a dicarboxylic acid with 3 to 22 carbon atoms, and

R_3 is an acyl group derived from an optionally substituted benzoyl or heterocyclic carboxylic acid that is substantially nontoxic,

or a pharmaceutically acceptable salt thereof.

The preferred acyl derivatives of 2'-deoxyadenosine are those wherein R_1 is an acyl group derived from an unbranched fatty acid with 6 to 16 carbon atoms, R_2 is H or an acyl group derived from an unbranched fatty acid with 6 to 16 carbon atoms, and R_3 is H or an acyl group derived from an amino acid with an acidic or basic side chain.

The preferred acyl derivatives of 2'-deoxyguanosine are those wherein R_1 is an acyl group derived from an unbranched fatty acid with 6 to 16 carbon atoms, R_2 is H or an acyl group derived from an unbranched